Decentralized ebike-energy-to-grid platform

$\mathcal{DEEP}$

June 20, 2019

Contents

Abstract

Green power generation, storage and distribution will be composed of millions of small, decentralised power sources of producers and consumers, the prosumers. In such systems, it will be important to connect efficient green power devices to batteries to secure and instantaneous, autonomous green energy transactions across prosumers as energy market conditions change. In this proposal we aim to 1) quantify green power production of pedal turbine generators for bike networks of different sizes, and 2) integrate green power production to a decentralized ebike energy-to-grid platform (DEEP) using blockchain technology. We propose an integrated smart-testnet mini-grid prototype connecting pedal turbine generators to open-source energy blockchain platforms containing producers and consumers to study the feasibility and scalability of ebike-to-energy networks. We outline the bottlenecks, the improvements needed, and a roadmap for the future of coupling efficient pedal power turbine generators to decentralized open-source computer and power networks.

Keywords: Green energy. Interconnected networks. Plug-in electric bikes. ebike networks. Smart mini-grid. Computer networks. Power network. Blockchain. Energy harvesting. Micro-energy storage.

Lay summary

Integrating pedal power turbine generator-battery to blockchain energy platforms (i.e., Hyperledger fabric, Tobalaba, Grid+)

—Transdisciplinarity———————————————————————————————-
Data science and modeling: Efficiency curves integrating turbine generator speed (rpm) vs. Output power (W) vs. riding time
(proxy of generator speed) vs. Power (W) bicycle dynamic models, thermodynamics constraints
Engineering and design: oriented harvesting energy
Computer science: Distributed and blockchain open-source software, for example the VESC open-software
Electric engineer: Designing pedal power turbine generators to connect them to dual battery, inverters and micro-grids
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PROS
0. Reduce $C0_2$ across the energy cycle
1. Green energy — sustainable development
2. Local smart grid development
3. Bottom-up: distributed individual-community prosumers
4. Urban bike network development and functional e-mobility networks
5. Research about efficiency and smart metrics by tracking and sharing energy production-consumption data
6. Real time price in the green energy markey by connecting many-to-many battery types-decentralized-green energy platforms
7. Deregulation energy production many countries
8. Frame architecture-design oriented to produce energy

CONS
0. Gear box turbines not developed for the bicycle industry
1. Low efficiency dual battery
2. Low energy recovery
3. Energy production mostly for large kms/day
4. Absence of infra like inverter-energy-to-grid networks in urban landscapes